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The Metaphors of Emerging Technologies: Unpacking the disconnects between the "what" and the "how" in the world of "online shopping"

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Abstract

Emerging technologies often produce unexpected consequences that existing institutions and policies are unable to deal with effectively. Because predicting the consequences of technological change is difficult, responses to emerging technologies tend to be reactive (if not passive), rather than proactive. Improved understanding of the potential consequences of a particular technology would enable policymakers and analysts to implement appropriate measures more quickly and perhaps even act prospectively. This paper proposes a general approach that can be used to identify potential sources of disruption resulting from emerging technologies in order to enable proactive policy actions to limit the negative consequences of these disruptions.

New technologies are often characterized through the use of metaphors and/or comparisons to existing technologies. While such comparisons provide an easy way to generate understanding of a new technology they often also neglect important aspects of that technology. As a result, the use of metaphors and comparisons creates a disconnect between what the metaphor suggests is happening and what is actually taking place. The incompleteness of the metaphors leads to a disparity in the appreciation of the benefits, and pitfalls of a new technology. This disparity allows certain aspects of the technology to be ignored and/or exploited, with potentially disruptive social consequences. An analysis of the mismatch between metaphorical characterizations and the actual attributes of a new technology can help identify otherwise

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overlooked issues and determine if existing institutions and policies can adequately respond.

This paper uses a study of personalization technologies by online retailers to demonstrate the potential for disruption caused by failures of metaphor to adequately describe new technologies. Online retailing technologies have equipped firms with tools that allow them to move closer to the "mass market of one" — satisfying the demands of a mass market through individually-targeted sales strategies (i.e., personalization). While the metaphors of "shopping" and "catalog" have been used to describe online retail "stores," these metaphors fail to capture several key aspects of online retail technologies such as aggregation, replication, persistence, and analysis of the personal data easily collected by such businesses. As a result, the institutions that exist to protect consumers when dealing with traditional, physical stores may no longer be sufficient. Furthermore, the pervasiveness of the metaphor undermines the ability of consumers to understand or debate the negative consequences of personalization, especially in the areas of privacy and identity.

Introduction

The language of technological innovation is characterized by the use of metaphors to acquaint the public with the unfamiliar. The "horseless carriage," the "electronic brain," the "genetic code" — these metaphors, clearly clever approximations at best, have nonetheless become inextricably intertwined with the technologies and discoveries they were coined to describe: the automobile, the computer and DNA. They are retained as a part of the history and the language of these developments, despite their deficiencies as descriptors. These metaphors, used to understand a new technology, lead to equating something new to something familiar, thereby easing the process of learning. However, because the metaphor is a necessarily imperfect instrument of description, it highlights only some qualities of a new technology or concept, while blurring or obscuring others. As noted by Birner [2004], this process leads to a skewed understanding of the world, with the intention of generating both insight and misconception.

The ambiguity created by metaphor can be a powerful instrument for teaching and learning, as well as guiding scientific inquiry as researchers conduct formal investigations to resolve the ambiguities suggested by the metaphor [Boyd, 1979]. But the use of metaphor in the characterization of new technology can also engender a disconnect between what the metaphor suggests is happening and what is actually taking place. This disconnect leads to a disparity in the appreciation of the benefits and pitfalls of a new technology, and allows certain aspects of the technology to be ignored or exploited, with potentially disruptive social consequences. Policies to mitigate these consequences are

impeded by a lack of public outcry and awareness, which the metaphor itself prevents.

This paper seeks to articulate the ways in which societies embrace and adapt to the emergence of new technologies through metaphors, with a particular emphasis on striving to identify the circumstances under which certain metaphors should be rejected in order to promote policy discourse and formulation.

The Processes of Good (and Bad) Metaphor Creation

A developer of a new technology may create an evocative metaphorical phrase in the following way:

(a) identify a characteristic or operational feature of the technology that
(b) connects to something familiar in the public experience, and
(c) use that commonality to give the public a useful way to
(d) speak of and integrate the novel idea or mechanism into daily experience and, more importantly,
(e) build upon that understanding to make creative uses of the discovery or development.

Once the new becomes familiar and usable, the developer can focus on dissemination and promotion, without worrying about a full public understanding of what really makes the new thing "tick." This mechanism for developing understanding reflects the notion of the "mental model," an instrument for understanding how people learn when confronted with unfamiliar or complex technologies.

Mental Models

A mental model can be characterized as a small-scale model of external reality [Craik, 1943]. It is an internal model of the world or surroundings that can be used to try out scenarios, understand processes, and decide upon the best actions in a given situation [Johnson-Laird, 1983]. The concept can be thought of as an outgrowth of the notion of the "black box:" users perceive an input, a black box, and an output. Somehow the input is converted to the output in the box. The mental model is the user's explanation of what takes place in the black box [Rouse and Morris, 1986].

Mental models are constructed largely through observations and feedback, and are incomplete, abstract, and dynamic. A model is based on gathered information and updated as more information is available or acquired. If a system does not behave as expected, users can update their mental models to include the exceptional case [Moray, 1999]. Thus, a mental model is a simplification of the actual process, and one that is continually evolving. This evolution takes place because the user devises this model to reflect reality, and

predictions that fail to capture actual behavior drive the user to refine the model to reconcile these outcomes.

In a formal scientific and technical context, these mental models can be used to great advantage, and have shaped some of the most significant scientific debates of the last century.[1] Scientific understanding advances as deficiencies in existing mental models are exposed through rigorous experimentation leading either to refinement of the mental model to accommodate the new information (*c.f.*, the atomic theory of matter, originally devised by the ancient Greeks) or to a wholesale rejection of the mental model/theory (e.g., phlogiston and parthenogenesis). The scientific review process helps ensure that models are accepted by the community only when the evidence clearly supports the model.

In the domain of technology, the situation is a little more complex. Metaphors are used to convey a mental model to the public in order to facilitate adoption of the technology. By associating the new technology with an established "way of doing," the assumptions and presumptions that underlie the established way of doing can now also be associated with the new technology. When metaphors are employed to popularize, rather than theorize, the "governor" upon their rigorous use can be weakened, if not eliminated. In particular, the public's model of a new technology is not subject to the same review required by scientific research. The disconnects between a rigorous description of a new technology and the metaphors employed to popularize it are not surprising; after all, that is the nature of metaphor.

The selection of a particular model to popularize a technology is the product of human design and intent; as such it may be that a particular technology or device may be modified to more closely align with the desired mental model. These efforts to mimic the established way of doing can serve to mask differences between the two that might otherwise merit attention. In effect, the reliance upon *what* the technology does rather than *how* the technology actually works (and what is going on "behind the curtain") can be a direct consequence of a reliance upon this kind of learning and adaptation in the face of a new technology.

In the best cases, the failures of the mental model underlying the descriptive metaphor to accurately predict the consequences and implications of the new technology are recognized, leading to an evaluation of the metaphor's limitations. As a result, the scope of the metaphor can be refined to incorporate new understanding, or the metaphor may be rejected in favor of a better one.

[1] For example, Einstein's "God does not play dice with the universe" in his long-running debate over the quantum theory of matter.

Disruption of Learning — Commensuration

However, in more complex cases, a metaphor can become widely accepted despite its imperfections, and as a result, the process of learning is inhibited or halted. A key factor that tends to reinforce this disruption is known as "commensuration." Commensuration has been described by sociologists Wendy Espeland and Mitchell Stevens as the process of "transforming qualities into quantities," or "difference into magnitude" [Espeland and Stevens, 1998]. The purpose of commensuration is to reduce the inherent complexity of fundamentally different objects or concepts by assigning a numerical value to each that can then be easily compared. For example, while apples are obviously different from oranges, when assigned a quantifiable metric — based, for example, on caloric, vitamin, fiber and water content — it becomes possible to compare them. But the process of commensuration carries a variety of attendant consequences that belie the otherwise logical process of comparing two numerical values with one another.

Often, commensuration is used to assign values to things that would seem to have no inherent value, or be of inestimable value. Espeland and Stevens [1998] use the example of an economist attempting (and ultimately failing) to assign a "value" to recreational activities on a river that would be eliminated by building a proposed dam. Unable to devise a suitable metric, the economist eliminates the activities from the analysis of the dam proposal, rendering this aspect of life around the river "invisible."

The ease with which one can compare numbers obscures the true complexity of the relationship between the compared items. Furthermore, in many cases, once a metric has been devised and widely accepted, the association of that metric with the appropriate context can weaken[2] [Espeland and Stevens, 1998]. At some point, the metric can take on a life of its own, becoming the basis for comparison, irrespective of context. Unsurprisingly, this can lead to a conceptual vacuum where there is considerable concern about the application of a metric without sufficient language to describe what's upsetting about its use. Sociologists have observed that this detachment from context commonly happens with successful metrics, leading, in the best cases, to confusion about what precisely is at issue (such as with standardized testing) and, in the worst cases, to the imposition of a Procrustean bed to compel a comparison that is socially and intellectually offensive [Espeland and Stevens, 1998].

In effect, while commensuration is useful for making comparisons, it carries with it the hazard of conflating commensurability with equivalence — e.g., the idea that, since one can use dollars to measure the relative desirability of an increment of safety, then one can assert that dollars and lives lost are equivalent. When stated so nakedly, of course, such

[2]See also Gentner *et al.* [2001] which suggests that human cognition may also reshape the metaphor itself in a similar fashion.

confusions can be easily avoided,[3] but the influence of such confusion upon discourse can be immense.[4] In the worst cases, commensuration can lead to policy discourse and actual policies that monitor and address specific metrics while ignoring or even worsening the actual problem that the metrics were devised to address.

Hypothesis

Metaphorical characterizations of new technologies that provide a simplified picture of a new technology generate information asymmetries that can give some actors incentives to promote or sustain the metaphor. As the metaphor gains traction, a variety of quantitative metrics, framed by the metaphor and arising through the process of commensuration, are proposed to describe how the performance of the new technology is superior to the conventional ways of doing. As these metrics continue to be employed (apparently successfully), people tend to embrace the metric as not merely an indicator of performance, but as *defining* expected performance.

Because such metrics tend to focus on a subset of performance attributes (to the exclusion of all others), they further reinforce the metaphor despite its defects, and prevent an evaluation of its limitations. Without an evaluation of the metaphor, substantial disconnects between the popular appreciation of the technology and its actual implications are generated. These disconnects can lead to a breakdown of the instruments of social and political discourse employed to resolve conflicts. As a result, negative side-effects of the technology are left unchecked, possibly engendering rising unrest with no effective outlet.

This sequence leads to the following hypothesis:

Observation: There is frequently a disconnect between (1) the metaphors used to describe **what** a new technology does and (2) **how** the new technology actually works.

Hypothesis: The nature of this disconnect is

- a key indicator that the technology may be socially disruptive;
- an insight into the source of the possible disruption(s); and
- a pointer toward the institutions that are central to managing and mitigating the consequences of the technology.

[3] See, for example, Weeks [2005] which discusses the foolishness of Amazon's "Fun Stats"

[4] See, for example, "The Chemistry of a 90+ Wine" [Darlington, 2005], discussing the confusion arising out of the notion that analytical chemistry and a proprietary model can/should predict a critic's score of a wine vintage. By striving to produce a product whose "Parker score" is over 90, a widely recognized ranking scale that has substantial influence in the marketplace, one loses track that there just might be more to winemaking than making Robert Parker happy. Yet, as one reads this article, all one finds is a vague sense of disquiet about the notion of winemaking to chase a specific score.

To illustrate this process, as well as to support the above hypothesis, this paper will turn to the consideration of a specific example both as a metaphor and as a technological process: "online shopping.[5]" In the following sections, we will show that "online shopping" is another of those imperfect metaphors, like "electronic brain" and "genetic code," that has gained currency because of its utility in presenting a novel concept in the trappings of a familiar one. However, "online shopping" is also an exemplar of the pernicious effects of a powerful metaphor that not only glosses over important differences between the description and the reality of the technology, but also gives interested parties instruments to interfere with, if not defeat, active discussion and consideration of remedies for problems arising from those differences.

The Rise of Online Shopping

Online retail has been a major growth area in Internet use in the United States in the last decade [U.S. Dept. of Commerce, 2004]. The ability to search for a broad range of products across a large number of online retail outlets is seen as one of the key drivers of this growth, and has led to the development of new networking technologies as well as new network-accessible retail outlets [Alba *et al.*, 1997; Petrison *et al.*, 1997]. Government policies — most notably, federal preemption of Internet-specific state sales taxes — have also spurred this growth [Pub. L. 105-277, 1998].

The Internet has also become a major marketing channel, enabling the delivery of information about product features, prices, and availability not only to consumers actively seeking this information, but also to other Internet users through a wide range of marketing and advertising instruments. Furthermore, Internet-based tools allow direct online retail transactions, taking order information, collecting payment information and directing shipping. In the case of digital goods (e.g. software, music), the network can also deliver the actual product.

Many early websites were structured like online "catalogs" with limited searching and sorting ability, difficult or unattractive interfaces, and a lack of sufficient and clear transactional paths. By the late 1990s designers had hit upon the notion of "personalizing" the online experience as a way to cope with the competing objectives of simplicity and completeness.

[5] A PoET working paper [Black *et al.*, 2006] describing this case is available online.

Personalization Technologies

In its most basic sense, personalization meant tailoring a user's experience at a site according to that user's behavior — not only over the course of a particular visit, but also across subsequent visits. For example, while a customer might be obliged to indicate her preferred language the first time she arrived at a webpage, designers wanted to ensure that the user did not have to repeat that selection each time they returned to the site. The "stateless" nature of the Web's hyper-text transfer protocol (HTTP), however, did not provide an immediate avenue for "remembering" user-specific information. While there were many possible methods to resolve this operational difficulty, the combination of the then-widespread use of the Netscape web browser and that firm's specification of the "cookie" became the basis for the standard methods, later enshrined in RFC2109, for retaining the "state" of the web client as the user navigates a website [Netscape Corporation, 1999; Kristol and Montulli, 1997, 2000].

With the deployment of "cookie" technology in webservers and clients, it became possible to store identifying information on client computers that could be tied to database records maintained by retail companies (and accessible to their webservers). The ability to "remember" a user quickly became a basis for doing far more than merely simplifying website navigation. Information routinely collected during retail transactions and reused on subsequent visits — such as past purchases, mailing and shipping addresses, and credit information — gave Internet retailers further ways to ease the mechanics of the online retail experience in addition to "simplifying" the shopping experience. These refinements have included the ability to employ this past information to streamline online ordering [Hartman and Gehlen, 2005], suggest products based upon past purchase history [Bezos *et al.*, 2005] and even suggest products based on online behavior when at the retailer's website [Linden *et al.*, 2005]. Continuing refinement of the technology has enabled retailers to harvest a vast amount of "clickstream" data, tracing a customer's website actions and employing that data to continually refine the user's experience.

Personalization and Online Shopping

While personalization may have started out as a shortcut around good website design [Nielson, 1999], the marketing community believed that personalization would be a vital dimension/element of their goal of creating a "mass market of one" [Keenan *et al.*, 2002]. The effective application of personalization technology had the potential to cost-effectively deliver "mass market scale" sales at the scale of the individual (see Petrison *et al.* [1997] for a brief history of the evolution of these marketing techniques). A tutorial from 1999 is very explicit about the importance of information-mediated personalization in online marketing:

> Business-to-consumer e-commerce led to a rebirth of the concept of personalized or one-to-one marketing, this time on a mass scale. One-to-one marketing is the use of information about an individual to market specific products to that individual that are assumed or projected to be of interest to him or her. It is not a new concept. It is what storekeepers did with their regular customers for as long as there were small town or neighborhood stores. But the advent of automobiles, suburbia, department stores, superstores, shopping malls, and the like, largely turned personalized marketing into a historical relic. It is the thesis of this tutorial that recent advances in information technology, specifically the Internet, the World Wide Web, practical, large-scale database management, techniques for effectively processing large-scale databases, and, indeed, much faster processors, created an environment in which one-to-one marketing was not only reborn, but in which it can be practiced on a mass scale for the first time. [Gillenson *et al.*, 1999, pp. 4-5]

The introduction of personalization technologies, however, has revised the corporate business models that led retailers away from individualized retail experiences. Careful analysis of data that an individual generates during online shopping (via browsing history, inquiries and sales) enables mass market retailers and partnering financial and credit institutions to mimic attributes of the small-scale retailer — mainly selecting items from a vast inventory to satisfy the specific preferences of any individual customer.

As the costs of hardware and software used for personalization have decreased, personalization itself has become increasingly cost effective, enabling wider application [Petrison *et al.*, 1997; Tedeschi, 2005]. Moreover, the business of retail (both online and off-) has increasingly become one of continuous information collection, aggregation and analysis of customer behavior to develop better targeted marketing and retailing messages. The retail and marketing industry has been able to provide targeted, if not always individualized, attention to the consumer experience while cost effectively increasing the scale and scope of its operations [Ling and Yen, 2001; Wehmayer, 2005; Winer, 2001] through careful application of these tools (e.g., database marketing (DBM) [Lewington *et al.*, 1996] and consumer relationship management (CRM) [Winer, 2001]). Marketers are striving to create a customized retail experience — the "mass market of one" — by collecting individuals' information and then analyzing that information to extract or infer consumer preferences.

While personalization technologies have gotten cheaper, their specific benefits continue to be difficult to measure. Though a variety of customer data can be captured and stored during an online retail experience, the value of that data beyond basic demographics and purchase history remains unclear in most marketing contexts [Schneider, 2005].

Unpacking Online Shopping

As we have suggested, different actors are invested in particular metaphors, regardless of their deficiencies, and seek to promote them to meet their own ends. In this case, it is marketers who utilize the familiar metaphors of shopping to build the online experience according to existing customer expectations. However, it is instructive to explore the degree to which notions of "shopping" have changed since its migration into the online world. In particular, while personalization has been effectively used to offset the "one size fits all" consequences that typically accompany the development of a mass market retail operation, important changes have occurred in the relationships between retailers and their customers — changes whose implications have been felt, yet treated as an inevitable price of progress.

Conventional Shopping

The place to start is with a reexamination of the "ideal" notion of personalized shopping in the conventional sense, as cited in marketing literature [Ling and Yen, 2001]. A frequent customer of a retail establishment will commonly develop a personal relationship with the employees or proprietor of that establishment. To a certain extent, these employees will come to tailor their interactions with the frequent customer — for example, by identifying specific products whose attributes match up well with the customer's revealed preferences. A favorite waiter might know how to tailor a food item for a specific customer, or to offer insights into specific menu choices according to the customer's tastes.

Such interactions are beneficial to both the customer and the retail establishment. The customer gains access to market and product information that would otherwise be difficult and expensive to obtain (the scope of products available, the degree to which those products' attributes match up with the customer's preferences, insights into style, trends, etc.). At the same time, the firm gains through more efficient targeting of its sales message to the customer, as well as fostering loyalty that will help promote future sales.

As a consequence, many retail operations have tried to organize themselves around processes that help to facilitate the development of this type of seller-customer relationship. Salespersons have their "book" of customers, restaurant patrons have their favorite waiters, tables, etc., and there is a host of promotional instruments that has been developed around forming, nurturing and maintaining these relationships [Winer, 2001].

Online Shopping and the "Digital Familiar"

Through the agency of cookies and other identification techniques, online retail operations connect a customer's identity with sales histories (*sales "books" parallel*), store or cata-

log browsing behavior (*traditional salesperson interaction - suggestion, rejection, refined preferences*), comparable purchases by other customers (*trends/fashion parallel*) and other information to meet the customer's individual preferences. In this way, the salesperson of the "brick and mortar" retail outlet is replaced with a "digital salesperson" comprising web content delivery technologies, databases, and complex algorithmic processes used to provide personalized recommendations for products [Murthi and Sarkar, 2002; Karypis, 2001].

The "digital salesperson" knows what is for sale, the exact state of the seller's inventory and delivery infrastructure, a specific customer's purchase history, the purchase histories of virtually every other customer, and other intimate "back office" information that no conventional salespersons could know — and certainly not at the instant the customer enters the store. This "digital salesperson" is engineered to deliver a combination of services at a pace a conventional salesperson could never match. Rather than speaking of a "digital salesperson," it is perhaps more apt instead to speak of a "digital familiar[6]" [Barrett, 1999; Black *et al.*, 2005; West *et al.*, 1999].

This ambiguous relationship between customer and salesperson is naturally also evident in the arena of bricks-and-mortar shopping. Personalization technologies enable the online retail operation to mimic the behavior of a conventional retail "familiar" — the salesperson. A user visiting an online retail establishment encounters a situation engineered to be comparable to entering a conventional retail establishment. The webpage may "greet" the customer by name, list specific recommendations based on her last visit, or notably alter itself (particularly in terms of navigation) to correspond to settings or actions the user has influenced in some way. The decisions or data points that inform these personalized attributes are often not clear to the user. (Note, for example, that while relating to a real salesperson, a customer can always inquire about the rationale underlying a particular suggestion, such an option is rarely afforded in the online case.). A user visiting a personalized site may not, in fact, even realize that the content is being personalized unless that user is able to observe another customer accessing the same site and receiving

[6]In the world of literature, a "familiar" is often portrayed as a medium between one world and another. It exists to support the actions and needs of an individual, but its true allegiance is mysterious. Shakespeare's Ariel in *The Tempest* is a classical literary example of a familiar. For a more modern literary example of the mixed benefits of a familiar, consider "Never trust anything that can think for itself if you can't see where it keeps its brain" in Rowling [1999]. While it appears to serve the individual, familiars also serve their own ends, and the line between the two is blurry. Familiars possess the ability to know all, but choose to reveal only snippets of information at times of their choosing. The individual who is reliant on a familiar for aid or direction never knows if what the familiar reveals is designed to help the individual achieve her own goals, or to help the familiar at the expense of the individual, or some combination. The individual, without the gift of sight possessed by the familiar, is left with little choice but to trust that the familiar's intentions are good and the information is reliable. While not necessarily "evil," familiars are not necessarily trustworthy, either [Wilby, 2000]

different content. This "digital salesperson" provides clear benefits to the customer seeking a convenient, fast and easy online retail experience. The technologies that enable these benefits, however, merit more careful examination. While personalization technologies have been deployed to recapture the "look and feel" of an idealized, small town shopping experience, there are significant differences in the "back-end" of personalization technologies which can be quite arresting, if not upsetting.

The Digital vs. the Human Familiar

While the interaction with a human or digital familiar may produce a comparable customer experience, a digital familiar differs from a human sales person in important ways. Specifically, a digital familiar can be distinguished from a human sales person by three technological and infrastructural features:

Data persistence

Digital familiars never forget. This is a radical departure from traditional shopping because not only do human familiars forget, but they also quit, are fired, retire, and so on. The benefit of persistence is the retention of an individual's preferences. When a human agent is replaced, much of her knowledge of her customers goes with her. Since digital familiars always remember an individual's preferences, the customer will not have to deal with a new trainee taking over for her favorite salesperson and struggling to meet her preferences. On the other hand, forgetting can have value as well. Persistence can be used to exploit customers — for example, a former smoker might continually receive offers for free cigarettes. Additionally, it may create situations where one is continually haunted by one's past. Just as a criminal record can follow someone for her entire life, one's shopping record may potentially have a similar effect. [Winer, 2001].

Data replication

"Replication" refers to the ability to copy and transmit digitally stored data, which can often be done for little or no marginal cost. Information collected by a single agent can be made instantaneously available throughout an entire organization. In a traditional retail context, there are significant limits to the ability of each human salesperson to capture, record, and transmit such data throughout the organization. Furthermore, cultural and social influences, such as competition between salespersons, may also limit a human salesperson's willingness to share certain information. A digital familiar, unconstrained by either mnemonic, economic or cultural limitations, can pass along all information it

collects to an unlimited numbers of others (with or without the customer's knowledge) [O'Harrow, 2006; Solove, 2004; Clarke, 1988].

Replication can be beneficial in facilitating interactions with large organizations, such as hotel or restaurant chains than can instantaneously know the preferences of a customer no matter which location the customer visits. Such benefits entice consumers into participating in data collection programs, especially when combined with price reductions or other incentives [Schoenbachler *et al.*, 1997; Winer, 2001; Wehmayer, 2005]. But digital data can be easily "stolen" via replication, while leaving the original in place. Replication also makes it difficult to determine how many copies of a particular data set exist and where, complicating the ability of a company to purge its records concerning a particular customer or transaction in response to the consumer's request or even a court order.[7] Detecting and assigning responsibility for breaches of data security becomes very problematic under these circumstances, especially when companies/entities are sharing data from a variety of sources.

Data analysis and integration

Integration includes the ability to combine data from various sources/vendors — Amazon, WalMart, grocery stores, credit card companies, etc. This attribute is mainly a change in scale and scope, since credit card companies have long had the ability to track historical purchasing records. Integrating information from personal ads and dating services, chat servers, email and online purchasing can give rise to a broader range of information, but is not obviously different than the information collection conducted already (e.g. credit bureaus). Particularly notable has been the increase in the use of government-collected data [McMillen, 2003; O'Harrow, 2006; Solove, 2004].

What is different is the extent of data integration, and the tools being deployed to exploit it. Data mining can be used to correlate disparate information about a person in an attempt to predict future behavior (e.g. purchasing preferences) and has given uneven results to date.[8] There is no guarantee that an increase in the amount of information collected with provide a concomitant increase in the ability of marketers and retailers to target advertisements to consumers (or reveal much else about an individual's identity). Certain

[7] Morgan Stanley, for example, was reprimanded by a judge in a case during which the firm continually discovered new email records after claiming that all such records had been turned over to the court [Anthes, 2005].

[8] On the other hand, the failures to do well have done little to limit the research into doing it better. Moreover, the fact that it works "well enough" for some applications has led to a broader application of the technology — applications within organizations that are less fastidious about the consequences of type I and type II errors in their classification of individuals: Total Information Awareness and its inheritors, for example [O'Harrow, 2006].

key pieces of data, such as demographic information and purchase history, may remain the only data of real value to retailers, and the utility of new methods is the subject of some debate [Russo Dos Santos and Gros, 2003]. It is unlikely, however, that unresolved questions about the value of data mining and other analysis and integration techniques will prevent their use and propagation, with or without greater understanding of the potential consequences.

The Fundamental Disconnect

In attempting to create an online experience that mirrors that of real world shopping, retailers using personalization technologies rely on a series of "behind the scenes" operational methods that have substantially different implications for consumers than traditional shopping. In online retail, there is only one "salesperson." Moreover, this "salesperson" is simultaneously "aware" of what every other user has ever purchased, and also knows (or, at least, has access to) everything that each user has ever scrutinized (the so-called "clickstream" information). This abstracted "salesperson" is wholly alienated from the conventional social contexts of shopping, so that the customer has no assurance of privacy in her transactions or shopping history, nor any sense of the communication cues that are otherwise available in face-to-face interactions with a human being that might engender the kind of trust relationships that are a part of real world personalized retail experiences.

The intrusive nature of each of these features (as well as those cited in the preceding section) may be offensive or threatening to many users. As a consequence, customers might elect to take their business elsewhere, as one might expect would be the case in a free market. However, with the increasing prevalence of personalization, database marketing and technology-driven customer relationship management, the alternatives are disappearing quickly [Turow, 2005].

Additionally, the instruments of personalization, created to facilitate online transactions, have now migrated to physical retail as well. The techniques of "clicks and mortar" retail can now be found in "bricks and mortar" retail, largely in reponse to competitive pressures [Cha, 2006]. While retailers have focused engineering a "mass market of one" through the application of personalization technologies, a world of continuous "dataveillance" has been created [Clarke, 1988]. In spite of the undesirable idea of constant surveillance and data collection in the bricks-and-mortar sphere, within the world of "everyday surveillance" [Lyon, 2002] online, shoppers have been urged to accept that a desire for privacy is something to "get over" [Sprenger, 1999].

Ubiquitous Personalization, Digital Identities & Privacy

A worrisome consequence of data collection is that once a data repository has been established, innovative uses wholly unanticipated at the outset are developed, irrespective of the original intent behind its collection. Observers have noted that, in a world of increasing data collection, storage and analysis, the information genderated by our day-to-day activities becomes associated with an individual though the application of personalization technologies. Firms have found that the same efficiencies in operation that lead to the "mass market of one" can also be generalized to a host of services other than marketing (e.g., credit, insurance, etc.) [Clarke, 1999; O'Harrow, 2006; Solove, 2004]

With the increasing availability of information tied to the individual, and commercially traded among firms, the costs of classifying individuals, inferring behavior and establishing identity are falling. Firms are devising a host of new services that make use of, and depend upon, that transactional efficiency. However, as more and more services become dependent upon the availability of personalized information, these services also begin to institutionalize the very problem raised by commensuration — the conflation of the metric and its measures with the real. Additionally, the objects of the metrics — the people — are often totally in the dark about what metrics are assigned to them, what they mean, and how they are devised and implemented. Like Joseph K in Franz Kafka's *The Trial*, consumers of credit, insurance or retail items can one day find themselves labeled as undesirable risks by firms with no sense of why or how this determination was made [Solove, 2004].

As Solove [2004, pp. 48-49] puts it in *The Digital Person*:

> [T]he information in databases often fails to capture the texture of our lives. Rather than provide a nuanced portrait of our personalities, compilations of data capture the brute facts of what we do without reasons. [...] In short, we are reconstituted in databases as digital persons composed of data. The privacy problem stems paradoxically from the pervasiveness of this data—the fact that it encompasses much of our lives—as well as from its limitations—how it fails to capture us, how it distorts who we are.

The data stored about any individual, no matter how comprehensive, will always be limited and unable to capture the full identity of the person. Moreover, the algorithms employed to generate derived metrics or indicators of identity (e.g., good credit risk, potential fraud threat, likely terror suspect) will always be subject to type I and type II errors [Clarke, 1988]. Despite these failures, the incomplete "digital identity" (another troubling metaphor) will increasingly become the proxy for each person in the online world and will increasingly be employed in preference to "real identity," if only because of the transactions costs [Leland and Zeller, 2006]. In fact, some would argue that the distinction between real identity and digital identity already is false [Zwick and Dholakia, 2004].

Compounding this issue is the degree to which this set of practices has migrated from the commercial world and has become a part of federal, state and local processes in the United States [O'Harrow, 2006]. While systems that mate commercial data sets with government records and criminal reports are legal in the US, they have been the source of violent reactions when fully appreciated by the public [American Civil Liberties Union, 2004]. And, when the government's scrutiny is limited by databases whose contents and validity are the consequence of processes not fully appreciated (or, worse, kept purposely secret), the consequences of error for the individual can be far worse than a rejection of credit (see, for example, "Database Tagged 120,000 as Possible Terrorist Suspects" [Associated Press, 2004] and "Waking Up to Recurring ID Nightmares" [Zeller, 2006]).

It is instructive to examine briefly how the defects in understanding arising from commensuration in the domain of identity inform one of the great debates of the digital age — the notion of a right to privacy. The unexamined reframing of context implicit in the increasing acceptance and power of digital identity helps to cripple the public debate that is increasingly necessary in the face of the problems and abuses that confront digitized societies. The legal notions of privacy in the US derive from a law review article written over 100 years ago in response to another set of emerging technologies. Warren and Brandeis [1890], surveying the rise of gossip and yellow journalism that accompanied the development of smaller (and, thus, no longer confined to a studio) cameras and improved photograph production and reproduction technologies. This article identified gaps in the then-current legal structure of harm and redress, and strove to extract a set of principles implicit in the common law suggesting that privacy was a right to be defended. While the legal doctrines of privacy have evolved since then, many observers today indicate that there are fundamental problems at the heart of how one defines the notions of privacy and identity [Kang, 1998; Solove, 2004].

While the legal profession has an established doctrine regarding privacy, the public debate of these topics is arguably bankrupt. The digital identity has made it possible for many to suggest that privacy, like the corner grocery store, is a bit of quaint nostalgia that one cannot afford to retain in the modern world [Sprenger, 1999]. The fact that these digital identities are largely the construct of commercial entities has led to the claim that these identities are property — and, moreover, that they are the property of the entities that created them, rather than those for whom they are stand-ins [Zwick and Dholakia, 2004].

The popular press is full of stories about the perils of these developments, yet the individual is left with a sense of helplessness and no foundation upon which to begin a meaningful debate about the technologies or their uses. The widespread acceptance of the digital identity as an appropriate substitute for human identity, and the reshaping of modern life around its use, has already made debate about the appropriateness of these practices almost impossible — the use of metaphors, mental models and commensuration

has already enabled the establishment of norms of digital identity without great scrutiny of the bases upon which they are built, or even the acknowledgment that these bases might be distinct from those of conventional identity. In the absence of a public discussion, the two forms of identity have become interchangeable without the construction of the social and institutional policies that might remediate the negative consequences of the widespread supplanting of conventional identity with a digital identity.

Metaphor and Technology Policy

Persistent disconnects between the understanding of **what** a technology does and assumptions about **how** it does it lead to a number of negative consequences. In the case of online personalization technologies, problems associated with identity and privacy protection are the most notable. But the extent and severity even of these acknowledged issues remains underexplored, and governmental policies to help prevent misuses are clearly insufficient. More importantly, a productive policy discourse around these issues is not taking place. In the meantime, incidents of identity theft and compromise of personal data, sometimes on a massive scale, persist (and, some might argue, are getting worse and more widespread).[9]

A significant part of the problem lies with the metaphors that are used to associate the offending technologies with more familiar, well-regulated technologies. These metaphors tend to highlight the benefits and obscure the problems of the newer technologies. As a result, a significant portion of the public does not perceive the connection between the technologies employed to make shopping more convenient and the identity & security problems that arise their use. An Annenberg Survey from June 2005 demonstrates elements of this disconnect [Turow *et al.*, 2005]:

- 64% of American adults who have used the Internet recently do not know it is legal for "an online store to charge different people different prices at the same time of day." 71% don't know it is legal for an offline store to do that.
- 64% do not know that a supermarket is allowed to sell other companies information about what they buy.
- 75% do not know the correct response—false—to the statement, "When a website has a privacy policy, it means the site will not share my information with other websites and companies."
- 66% disagree that "it's OK with me if the supermarket I shop at keeps detailed records of my buying behavior."

[9]The recent loss of veterans' personal records by the Veterans Administration highlights both the scale of the problem (over 2 million records are thought to have been stolen) but also the uncertainty about whether the thieves even knew what they were stealing, know how to exploit it, or how the compromised individuals can protect themselves from harm. See Yen [2006].

- 72% disagree that "if a store I shop at frequently charges me lower prices than it charges other people because it wants to keep me as a customer more than it wants to keep them, that's OK."

As these results illustrate, a majority of respondents neither understand nor appreciate the nuances of what actually takes place with the storage, exchange and protection of their personal data from online transactions. This paper argues that insufficiently descriptive metaphors are the main culprit behind this misunderstanding. While groups such as the Electronic Privacy Information Center (EPIC) and the American Civil Liberties Union (ACLU) attempt to discuss and address the problems of identity, privacy and other issues posed by Internet technologies, the general public has been largely left out of the conversation [Leland and Zeller, 2006].

As long as the metaphors employed to understand personalization and online technologies remain inexpressive of important, fundamental features of their application, the disconnect will persist, rendering a policy discourse largely impossible. This not only alienates the public from a productive discourse about policy solutions to technological problem, but additionally, according to Schön [1979], unnecessarily narrows the scope of acceptable solutions that might be pursued to address these problems in a policy context. These metaphors can become so ingrained that important problems can become difficult to disentangle from the metaphor. Schön [1979] calls these sorts of metaphors "generative metaphors," and describes their role in policy making:

> The notion of generative metaphor then becomes an interpretative tool for the critical analysis of social policy. My point here is not that we *ought* to think metaphorically about social policy problems, but that we *do* already think about them in terms of certain pervasive, tacit generative metaphors; and that we ought to become critically aware of these generative metaphors, to increase the rigor and precision of our analysis of social policy problems by examining the analogies and "disanalogies" between familiar descriptions — embodied in metaphors like "fragmented services" — and the actual problematic situations that confront us. [Schön, 1979, p. 256]

The solution to this problem must therefore begin by addressing the disconnects in the public's understanding of the technologies in question. To do so, we must learn to confront the prevailing metaphors with greater skepticism. Understanding the process of metaphor creation can reveal both the deficiencies of a given metaphor, and also the specific aspects of a new technology that deserve regulatory attention. As we confront the metaphors, however, we must also confront the supposed benefits of the technologies they describe. This means asking hard questions about whether the convenience of online shopping, for example, outweighs the various potential harms that arise from its proliferation.

A strictly economic calculus that relies on metrics generated through commensuration is fundamentally inadequate to addressing the scale and scope of the issues.

Conclusions

This paper argues that the choice of metaphor can have important consequences for the way society adapts to the presence of new technologies and discoveries. Policymakers and jurists routinely rely upon metaphors to help frame their thinking about novel circumstances, and selection of appropriate metaphors is fundamental to ensuring that effective progress on important problems is made [Schön, 1979; Blavin and Cohen, 2002]

Misapplication of such metaphors can lead to seemingly intractable problems, and because of the inherent limitations of reasoning from mental models, such traps can be particularly insidious [Gavetti and Rivkin, 2005]. A particularly dangerous case occurs when the mental model underlying the metaphor is wrong, but it nevertheless generates predictions that seem correct. Such a disconnect has a potential negative influence upon society's abilities to adapt to these changes. Further, technology, and the science that support it, continues to advance at a rapid pace while the level of public literacy in these fields may not be keeping up. This combination suggests that the number of these disconnects will continue to increase.

While there are ongoing efforts to cite the hazards of the use of metaphors when developing plans for action in the face of unfamiliar circumstances (see, for example, Gavetti and Rivkin [2005]), the persistence of demonstrably poor, yet evocative, metaphors (*c.f.*, the "information superhighway") suggests that the appropriate avenues for policy action do not lie in attempts to "convert" the public to new ways of expressing themselves or regulating the promotional methods of technology innovators. Rather, a careful appraisal of the implications of the misunderstandings arising out of the use of these metaphors and anticipation of the problems arising from these misunderstandings seems to be the most effective way to mitigate the consequences of this way of framing the discourse. When the public comes to recognize that, in fact, it **does** matter what the "man behind the curtain" is doing, having a set of policy recommendations that is directed at the fundamental problem (or problems) will avoid the host of ills that would otherwise be expected to arise from a piecemeal, reactive response that merely treats the symptoms.

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